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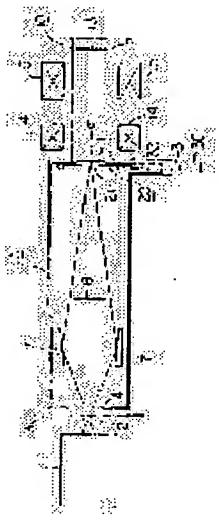
(54) ENLARGEMENT OBSERVATION DEVICE FOR RADIATION IMAGE

(57)Abstract:
PURPOSE: To obtain a sharp enlarged radiation image by providing a stop means which serves as a stop for radiation incident on a photoelectric converting means by the aperture adjustment of a stop window in front of the photoelectric converting means.
CONSTITUTION: The stop means 20 is positioned in front of a photoelectric surface 11 where the enlarged radiation image of a sample 2 is formed. The stop means 20 has the stop window 21 where radiation passes. The aperture size of the window 21 is adjustable, so the aperture for the radiation incident on the photoelectric surface 11 is adjustable. Then radiation which is scattered in a radiation image enlargement part 5 and does not relate to the image formation is cut off by the aperture adjustment of the window 21, so only the radiation for the image formation is incident on the photoelectric surface 11. Photoelectrons emitted by the photoelectric surface 11 are therefore only electrons corresponding to the enlarged image of the sample 2, so the sharp optical image can be formed on a fluorescent surface 13. Further, the visual field of radiation on the photoelectric surface 11 is limited to a necessary range, so what is called the generation of scattered electrons is prevented.



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CLAIMS

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(57) [Claim(s)]
[Claim 1] The radiation source which turns and carries out outgoing radiation of the radiation to a sample set location. The radiological image expansion section which expands the radiological image formed by passing the aforementioned sample set location. Photoelectrical operator stage which is arranged in the image formation position of the expanded radiological image, and forms an electronic image. It is radiological image expansion observation equipment equipped with the above, and is characterized by preparing a drawing means to perform drawing of radiation which carries out incidence to a photo-electric-translation means by opening adjustment of a drawing aperture in the front face of the aforementioned photo-electric-translation means.
[Claim 2] The aforementioned drawing means is radiological image expansion observation equipment according to claim 1 with which opening adjustment of the aforementioned drawing aperture is performed by remote operation.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Industrial Application]
this invention relates to the equipment which carries out expansion observation of the sample according to radiation, such as ultraviolet rays and an X-ray, and it is related with the radiological image expansion observation equipment which can obtain a clear sample expansion image especially.
[Description of the Prior Art]
Conventional radiological image expansion observation equipment is shown in a view 4. the radiation source 1 to which this carries out outgoing radiation of the radiation of a predetermined wavelength field, and the sample set with which a sample 2 is attached in a sample set location -- incidence of the radiation which opening of the entrance window 4 was carried out to the member 3, and passed the sample set location was carried out, and it is equipped with the radiological image expansion section 5 When the radiation source 1 has the wavelength distribution with this SOR light from the light to [distribution / the light source of the synchrotron radiation difficulty which carries out outgoing radiation of the synchrotron radiation (SOR light) is used, and] an X-ray and needs to carry out the selection transparency only of the radiation of specific wavelength fields, such as ultraviolet rays and an X-ray, a proper optical filter (not shown) etc. is prepared in the outgoing radiation edge of the radiation source 1. If the sample 2 prepared in the sample set location irradiates and radiation penetrates a sample 2, a radiological image will be formed and incidence of the radiation which carried out outgoing radiation from this radiation source 1 will be carried out to the radiological image expansion section 5. In the case 6 where the vacua was maintained, the oblique incidence reflecting mirror 7, a stopper 8, and a film 9 are arranged in order on the optical path of radiation, and the radiological image expansion section 5 is constituted. The radiation which carried out incidence to this radiological image expansion section 5 is reflected with the oblique incidence reflecting mirror 7, and a radiological image is expanded by this without relation to the wavelength field of radiation. And after unnecessary radiation is omitted with a stopper 8, image formation of the expansion radiological image is carried out to a film 9.
According to such observation equipment, the film 9 exposed according to radiation can be picked out from a case 6, and the expansion image of a sample 2 can be observed. However, with this equipment, the expansion image of a sample cannot be observed through a film 9, and the expansion image of a sample cannot be seen by the eye directly, but observation is inconvenient.
Then, directly [of the expansion image of a sample], the applicant developed the radiological image expansion observation equipment which made observation possible, and proposed previously (No. Japanese-Patent-Application-No. 62-274863; un-opening to the public). A view 5 shows this observation equipment and has the structure where the electronic augmentation section 10 was attached to the radiological image expansion section 5. And while the photoelectric surface 11 is formed in the image formation position of the radiation in the radiological image expansion section 5, in the electronic augmentation section 10, a micro channel plate 12 and a phosphor screen 13 are formed, and the outside of the electronic augmentation section 10 is further looped around coils 14 and 15. With such composition, image formation of the expansion radiological image is carried out to the photoelectric surface 11, and the photoelectron corresponding to this is emitted to the electronic augmentation section 10 from the photoelectric surface 11. This electronic image is expanded with coils 14 and 15, after multiplication of the expanded electronic image is carried out by the micro channel plate 12, image formation of it is carried out to a phosphor screen 13, and it forms an optical image. Therefore, the optical image on a phosphor screen 13 is observable directly through monitors, such as CRT.
[Problem(s) to be Solved by the Invention]
However, with the observation equipment of the 5th view , there is un-arranging [from which an optical image is not obtained clearly]. This is because an expansion radiological image not only carries out image formation to the

photoelectric surface 11, but the scattered radiation reflected within the radiological image expansion section 5 carries out incidence and an unnecessary photoelectron is emitted by this incidence. Moreover, when the visual field of the radiological image in the photoelectric surface 11 is large, the photoelectron generated in the position distant from the center of the photoelectric surface 11 may turn into a dispersion electron inside the electronic augmentation section 10, and may make an image indistinct.
Then, repeatability of this invention is good and it aims at offering the radiological image expansion observation equipment which can obtain a clear optical image.
[The means for solving a technical problem]
The radiation source which **** radiological image expansion observation equipment turns radiation to a data set location, and carries out outgoing radiation to this invention, In radiological image expansion observation equipment equipped with the radiological image expansion section which expands the radiological image formed by passing a data set location, and the photoelectrical operator stage which is arranged in the image formation position of the expanded radiological image, and forms an electronic image It is characterized by preparing a drawing means to perform drawing of radiation which carries out incidence to a photo-electric-translation means by opening adjustment of a drawing aperture in the front face of a photo-electric-translation means.
It extracts here, and as for drawing adjustment of a means, it is desirable that it is operational from the equipment outside, and, thereby, its operability improves.
[Function]
According to the above-mentioned composition, by adjusting the size of opening of a drawing aperture, scattered radiation is intercepted and only the expansion radiation from a sample carries out incidence to the photoelectric surface.
[Example]
Hereafter, an accompanying drawing explains the example of this invention.
A view 1 shows the radiological image expansion observation equipment concerning one example of this invention, and has given the same sign to the same element as the conventional example. Namely, the radiation source 1 to which this equipment carries out outgoing radiation of the radiation, such as ultraviolet rays and an X-ray the sample set with which a sample 2 is attached in a sample set location -- with a member 3 and the radiation augmentation section 5 to shoot and by which the ON reflecting mirror 7 and the stopper 8 were arranged in the interior It has the electronic augmentation section 10 which has the photoelectric surface 11, and the micro channel plate 12 and phosphor screen 13 as a photo-electric-translation means prepared in the image formation position of the radiological image expansion section 5, and were formed successively by the radiation expansion section. Moreover, the outside of the electronic augmentation section 10 is looped around coils 14 and 15. With such composition, the radiation which carried out outgoing radiation from the radiation source 1 penetrates a sample 2, and the expansion image carries out image formation to the photoelectric surface 11 of the radiological image expansion section 5, and the photoelectron (e-) emitted from the photoelectric surface 11 by this is expanded in the electronic augmentation section 10, and it carries out image formation by the phosphor screen 13.
In addition to such composition, by this example, it extracts and the means 20 is established. The drawing means 20 is established so that it may be located in the front-face side of the photoelectric surface 11 which the radiation expansion image of a sample 2 ****. This drawing means 20 is possible for the drawing aperture 21 while it has the drawing aperture 21 which radiation passes. [of drawing adjustment of the radiation which adjustment of the size of the opening is attained and carries out incidence to the photoelectric surface 11] Since the radiation which is scattered about within the radiological image expansion section 5, and does not participate in image formation by opening adjustment of this drawing aperture 21 is intercepted, only the radiation for image formation carries out incidence to the photoelectric surface 11. Therefore, since the photoelectron (e-) by which photoelectric-surface 11 shell method appearance is carried out turns into only an electron corresponding to the expansion image of a sample 2, it can form a clear optical image in a phosphor screen 13. Moreover, since it can restrict to the range which needs the visual field of the radiation in the photoelectric surface 11, the so-called generating of a dispersion electron can also be prevented. In addition, opening adjustment of the drawing aperture 21 is performed by the rotation operation of operating member 30 mentioned later.
A view 2 and the 3rd view show an example of the above-mentioned drawing means 20.
the drawing means 20 -- rotation -- it consists of a member 22 (view 2 (a)), converging section material 23 (this drawing (b)), and three members of a holddown member 24 (this drawing (c)), and it is attached so that these 3 members 22, 23, and 24 may carry out free passage formation of the above-mentioned drawing aperture 21 rotation -- as for the member 22, the gear 25 for adjustment is formed in a part of nothing and its periphery edge for the whole in the shape of an annulus ring moreover, rotation -- the member 22 serves as a base material in which each drawing wing

26 of the converging section material 23 is attached possible [rotation], and slit 22a which transmits the rotation force to the drawing wing 26 is formed in the direction of slant at the radial
The converging section material 23 consists of attaching two or more drawing wings 26 in the shape of a ring. The gryposis of each drawing wing 26 is carried out toward drawing aperture 21 direction, it is extracted by successive formation of the curved surface of the inside, and an aperture 21 is formed. moreover -- the edge inside each drawing wing 26 attached in this way -- rotation -- while carrier pin 26a inserted into slit 22a of a member 22 projects and is formed, hinge-pin 26b inserted in hole 24a of a holddown member 24 is projected and formed in the outside edge Hole 24a by which, as for a holddown member 24, ring ** is inserted in hinge-pin 26b of nothing and the drawing wing 26 is formed at intervals of predetermined. It is suitably fixed in the radiological image expansion section 5 through a bracket (not shown), a holddown member 24 is extracted by this fixation, and installation of a means 20 is performed.
here -- rotation -- the drive gear 32 meshes on the gear 25 for adjustment of a member 22 if this drive gear 32 is attached at the nose of cam of the rod 31 of operating member 30 as shown in a view 3, and a rod 31 is rotated in the state of engagement with the gear 25 for adjustment -- rotation -- a member 22 rotates to a clockwise rotation or a counterclockwise rotation such composition -- rotation -- it extracts to slit 22a of a member 22, and carrier pin 26a of a wing 26 inserts -- having -- **** -- rotation -- if a member 22 rotates, as for carrier pin 26a, the move force to the inner direction or the method of outside will act by slit 22a On the other hand, since hinge-pin 26b of the drawing wing 26 is inserted in hole 24a of a holddown member 24 and is supported pivotably, the drawing wing 26 rotates hinge-pin 26b as a supporting pivotably pivotably point. A wing 26 is extracted on the whole, it extracts by this rotation, opening of an aperture 21 is enlarged, or it acts so that it may be made small, and opening adjustment of the drawing aperture 21 is performed. Thus, with the structure of extracting by operation of the operating member 30 from the outside, and performing opening adjustment of an aperture 21, operability becomes easy. Therefore, clear-ization of an optical image by which image formation is carried out to a phosphor screen 13 can be performed easily.
this invention is not restricted to the above-mentioned example, but various deformation is possible for it.
For example, two or more drawing apertures from which the size of opening differs are formed in a rotor plate, and are extracted to it, a means is formed, a rotor plate is rotated, and you may make it switch the drawing aperture of the optimal size on the optical path of radiation. Moreover, you may be made to perform opening adjustment operation of a drawing aperture within a radiological image expansion portion.
[Effect of the Invention]
As mentioned above, as explained in detail, since the drawing means in which opening adjustment of a drawing aperture is possible is prepared in the front face of the photo-electric-translation means in which radiation carries out image formation in this invention and it was made to perform drawing of radiation, the scattered radiation used as the trouble of image formation can be intercepted, generating of a dispersion electron can also be prevented, therefore a clear expansion image can be obtained.

[Translation done.]

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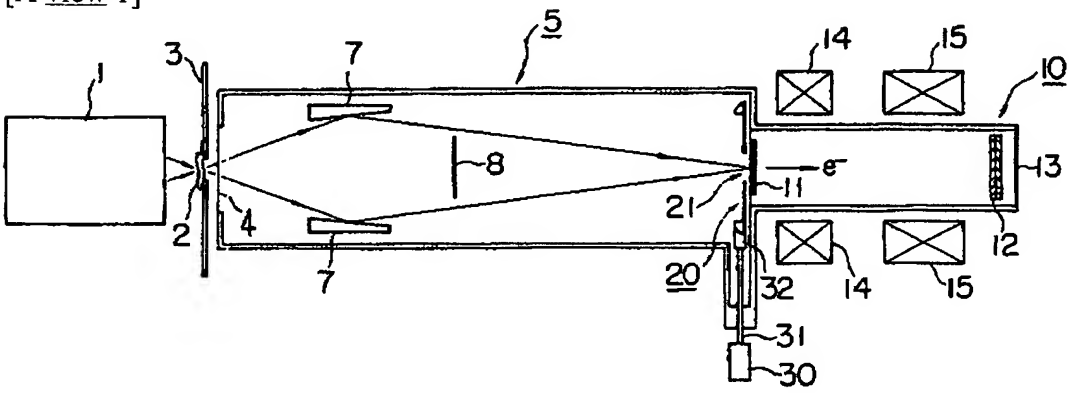
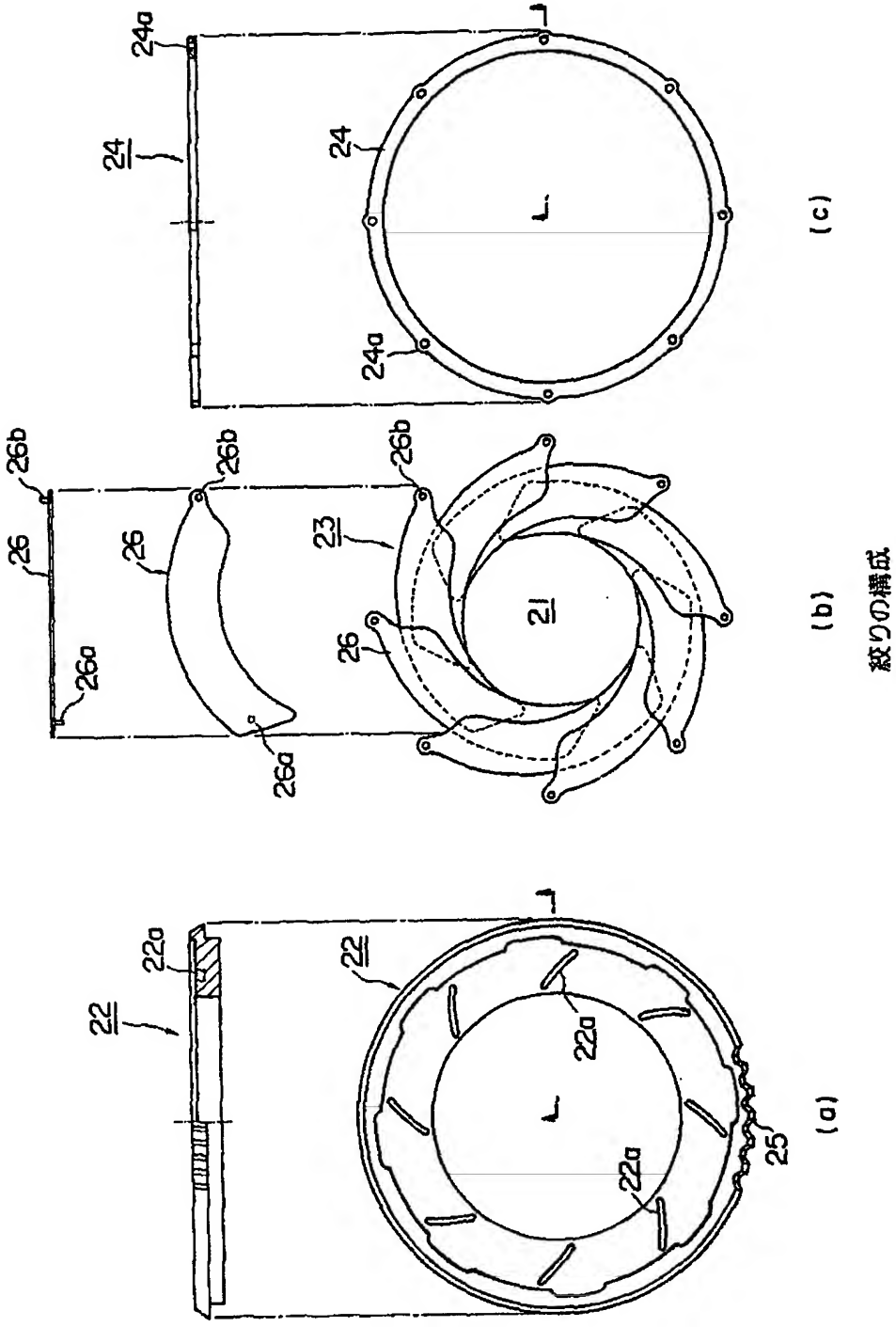
DRAWINGS

[A view 1]



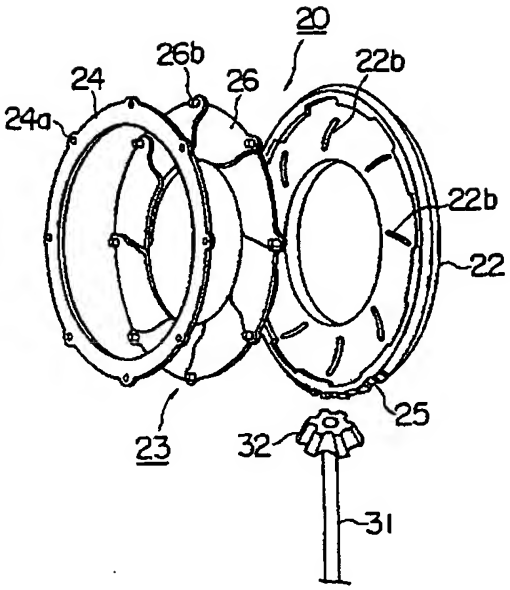
実施例の装置の全体構成

[A view 2]



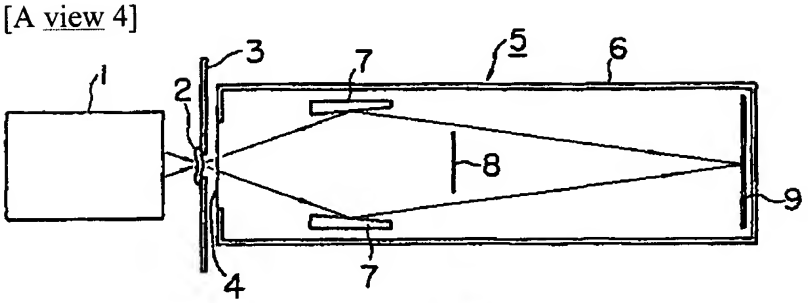
絞りの構成

[A view 3]



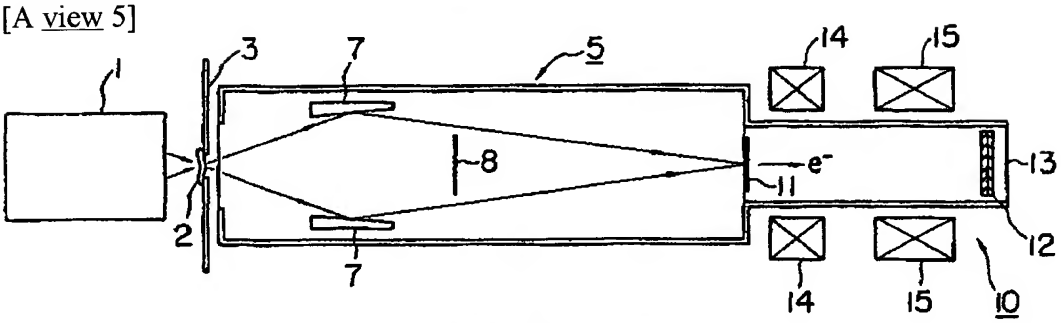
絞りの構成

[A view 4]



従来装置

[A view 5]



先願の装置の全体構成

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(56)参考文献　実開　昭49－46662（ＪＰ，Ｕ）

(54)【発明の名称】放射線像拡大観察装置

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(57)【特許請求の範囲】

【請求項１】放射線を試料セット位置に向けて出射する放射線源と、
前記試料セット位置を通過することにより形成された放射線像を拡大する放射線像拡大部と、
拡大された放射線像の結像位置に配設されて電子像を形成する光電交換手段とを備える放射線像拡大観察装置において、
前記光電変換手段の前面に、絞り窓の開口調整によって光電変換手段に入射する放射線の絞りを行なう絞り手段が設けられていることを特徴とする放射線像拡大観察装置。

【請求項２】前記絞り手段は、前記絞り窓の開口調整が遠隔操作によって行なわれる請求項１記載の放射線像拡大観察装置。

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【発明の詳細な説明】

〔産業上の利用分野〕

本発明は紫外線、Ｘ線などの放射線によって試料を拡大観察する装置に係り、特に明瞭な試料拡大像を得ることが可能な放射線像拡大観察装置に関する。

〔従来の技術〕

従来の放射線像拡大観察装置を第４図に示す。これは、所定波長領域の放射線を出射する放射線源１と、試料２が試料セット位置に取り付けられる試料セット部材３と、入射窓４が開口され試料セット位置を通過した放射線が入射され放射線像拡大部５を備えている。放射線源１は例えばシンクロトロン放射光（SOR光）を出射するシンクロトロン放射難の光源が使用され、このSOR光は可視光からＸ線に至る波長分布を有しており、紫外線、Ｘ線などの特定波長領域の放射線のみを選択透過さ

せる必要がある場合には、放射線源１の出射端に適宜の光フィルタ（図示せず）などが設けられる。この放射線源１から出射した放射線は試料セット位置に設けられた試料２に照射され、放射線が試料２を透過すると放射線像が形成されて放射線像拡大部５に入射する。放射線像拡大部５は真空状態を維持されたケース６内に斜入射反射鏡７と、ストッパ８と、フィルム９とが放射線の光路上に順に配設されて構成される。この放射線像拡大部５に入射した放射線は斜入射反射鏡７で反射され、これによって放射線の波長領域にかかわりなく放射線像は拡大される。そして不要な放射線がストッパ８でカットされたのち、拡大放射線像がフィルム９に結像される。

このような観察装置によれば、放射線によって感光したフィルム９をケース６から取り出して、試料２の拡大像を観察することができる。しかし、この装置ではフィルム９を介して試料の拡大像を観察するものであり、試料の拡大像を直接、目で見ることができず、観察が不便となっている。

そこで出願人は試料の拡大像の直接、観察を可能とした放射線像拡大観察装置を開発して、先に提案した（特願昭62－274863号；未公開）。第５図はこの観察装置を示し、放射線像拡大部５に電子像拡大部10が付設された構造となっている。そして、放射線像拡大部５における放射線の結像位置には光電面11が設けられると共に、電子像拡大部10内にはマイクロチャンネルプレート12および蛍光面13が設けられ、さらに電子像拡大部10の外側にコイル14, 15が巻装されている。このような構成では拡大放射線像が光電面11に結像され、これに対応した光電子が光電面11から電子像拡大部10に放出される。この電子像はコイル14, 15によって拡大され、拡大された電子像はマイクロチャンネルプレート12で増倍された後、蛍光面13に結像されて光学像を形成する。従って、蛍光面13上の光学像をCRTなどのモニタを介して直接、観察することができる。

〔発明が解決しようとする課題〕

しかし第５図の観察装置では、光学像が明瞭に得られない不都合がある。これは、光電面11には拡大放射線像が結像するだけでなく、放射線像拡大部５内で反射した散乱放射線が入射し、この入射によって不要な光電子が放出されるためである。また、光電面11における放射線像の視野が大きいと、光電面11の中心から離れた位置で生成した光電子が電子像拡大部10の内部で散乱電子となり、像を不鮮明にすることもある。

そこで本発明は、再現性が良好で、明瞭な光学像を得ることのできる放射線像拡大観察装置を提供することを目的とする。

〔課題を解決するための手段〕

本発明に明る放射線像拡大観察装置は、放射線を資料セット位置に向けて出射する放射線源と、資料セット位置を通過することにより形成された放射線像を拡大する

放射線像拡大部と、拡大された放射線像の結像位置に配設されて電子像を形成する光電交換手段とを備える放射線像拡大観察装置において、光電変換手段の前面に、絞り窓の開口調整によって光電変換手段に入射する放射線の絞りを行なう絞り手段が設けられていることを特徴とする。

ここで絞り手段の絞り調整は、装置外部から操作可能となっているのが好ましく、これにより操作性が向上する。

〔作用〕

上記構成によれば、絞り窓の開口の大きさを調整することにより、散乱放射線が遮断され、光電面には試料からの拡大放射線のみが入射する。

〔実施例〕

以下、添付図面により本発明の実施例を説明する。

第１図は本発明の一実施例に係る放射線像拡大観察装置を示し、従来例と同一の要素には同一の符号を付してある。すなわち、この装置は紫外線、Ｘ線などの放射線を出射する放射線源１と、試料２が試料セット位置に取り付けられる試料セット部材３と、射入反射鏡７、ストッパ８が内部には配設された放射像拡大部５と、放射線像拡大部５の結像位置に設けられた光電変換手段としての光電面11と、マイクロチャンネルプレート12および蛍光面13を有して放射線拡大部に連設された電子像拡大部10とを備える。また、電子像拡大部10の外側にはコイル14, 15が巻装されている。このような構成では、放射線源１から出射した放射線は試料２を透過し、その拡大像が放射線像拡大部５の光電面11に結像し、これにより光電面11から放出された光電子（e^-）が電子像拡大部10で拡大されて蛍光面13で結像する。

このような構成に加えて、本実施例では絞り手段20が設けられている。絞り手段20は試料２の放射線拡大像が結蔵する光電面11の前面側に位置するように設けられる。この絞り手段20は放射線が通過する絞り窓21を有すると共に、絞り窓21は、その開口の大きさが調整可能となって、光電面11へ入射する放射線の絞り調整が可能となっている。この絞り窓21の開口調整により、放射線像拡大部５内で散乱して結像に関与しない放射線が遮断されるため、光電面11には結像のための放射線のみが入射する。従って、光電面11から法出される光電子（e^-）は試料２の拡大像に対応した電子だけとなるため、鮮明な光学像を蛍光面13に形成することができる。また、光電面11における放射線の視野が必要な範囲に制限できるので、いわゆる散乱電子の発生をも防止できる。なお、絞り窓21の開口調整は後述する操作部材30の回転操作によって行なわれる。

第２図及び第３図は上記の絞り手段20の一例を示す。

絞り手段20は回転部材22（第２図（ａ））、絞り部材23（同図（ｂ））および固定部材24（同図（ｃ））の３部材からなり、これら３部材22, 23, 24が上記絞り窓21を

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連通形成するように組み付けられる。回転部材22は全体が円環状をなし、その外周縁の一部分に調整用ギア25が形成されている。また、回転部材22は絞り部材23の各絞り羽根26が回動可能に取り付けられる支持体となっており、絞り羽根26に回動力を伝達するスリット22aが斜め方向に放射状に形成されている。

絞り部材23は複数の絞り羽根26をリング状に組み付けることで構成される。各絞り羽根26は絞り窓21方向に向かって弯曲されており、その内側の弯曲面の連設によって絞り窓21が形成される。また、このように組み付けられる各絞り羽根26の内側の端部には、回転部材22のスリット22a内に挿入される受ピン26aが突出形成されると共に、外側の端部には固定部材24の穴24aに挿入される支ピン26bが突出形成されている。固定部材24はリング嬢をなし、絞り羽根26の支ピン26bが挿入される穴24aが所定間隔で形成されている。固定部材24は適宜ブラケット（図示せず）を介して放射線像拡大部５内に固定されるものであり、この固定によって絞り手段20の取り付けが行なわれる。

ここで、回転部材22の調整用ギア25には駆動ギア32が噛合されるようになっている。この駆動ギア32は第３図に示すように操作部材30のロッド31の先端に取り付けられており、調整用ギア25との噛合状態でロッド31を回転させると、回転部材22が時計方向または反時計方向に回転する。このような構成では回転部材22のスリット22aに絞り羽根26の受ピン26aが挿入されており、回転部材22が回転するとスリット22aにより受ピン26aは内方または外方への移動力が作用する。これに対して、絞り羽根26の支ピン26bが固定部材24の穴24aに挿入されて枢支されているため、絞り羽根26は支ピン26bを枢支点として回動する。この回動によって絞り羽根26は全体で絞り窓21の開口を大きくしたり、小さくするように作用し、絞り窓21の開口調整が行なわれる。このように、外部からの操作部材30の操作によって絞り窓21の開口調整を行なう構造では、操作性が容易となる。従って、蛍光面13に結像される光学像の鮮明化を簡単に行なうことができる。

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本発明は上記実施例に限られず、種々の変形が可能である。

例えば、回転板に開口の大きさの異なる絞り窓を複数形成して絞り手段を形成し、回転板を回転して最適な大きさの絞り窓を放射線の光路上で切り換えるようにしても良い。また、絞り窓の開口調整操作を放射線像拡大部分内で行なうようにしても良い。

〔発明の効果〕

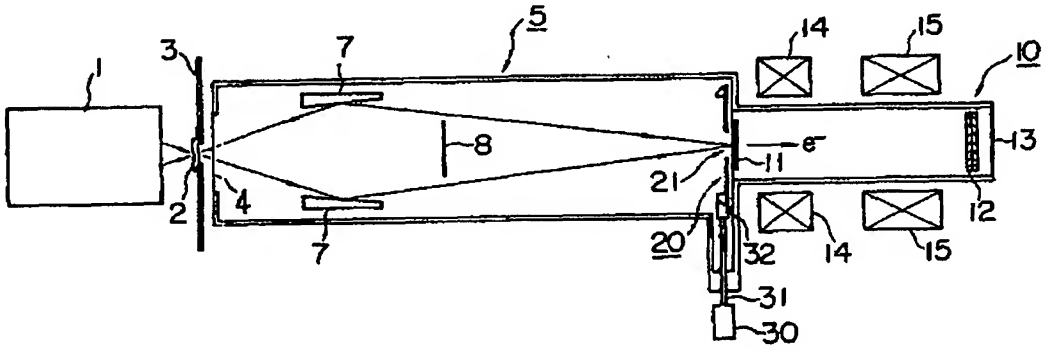
以上、詳細に説明したように本発明では、放射線が結像する光電変換手段の前面に、絞り窓の開口調整が可能な絞り手段を設けて放射線の絞りを行なうようにしたので、結像の支障となる散乱放射線を遮断することができ、また散乱電子の発生をも防止でき、従って鮮明な拡大像を得ることができる。

【図面の簡単な説明】

第１図は、本発明の実施例に係る放射線像拡大観察装置を示す構成図、第２図は、その絞り手段の各部材を示す構成図、第３図は、絞り手段の分解斜視図、第４図は、従来装置を示す構成図、第５図は、改良された拡大観察装置を示す構成図である。

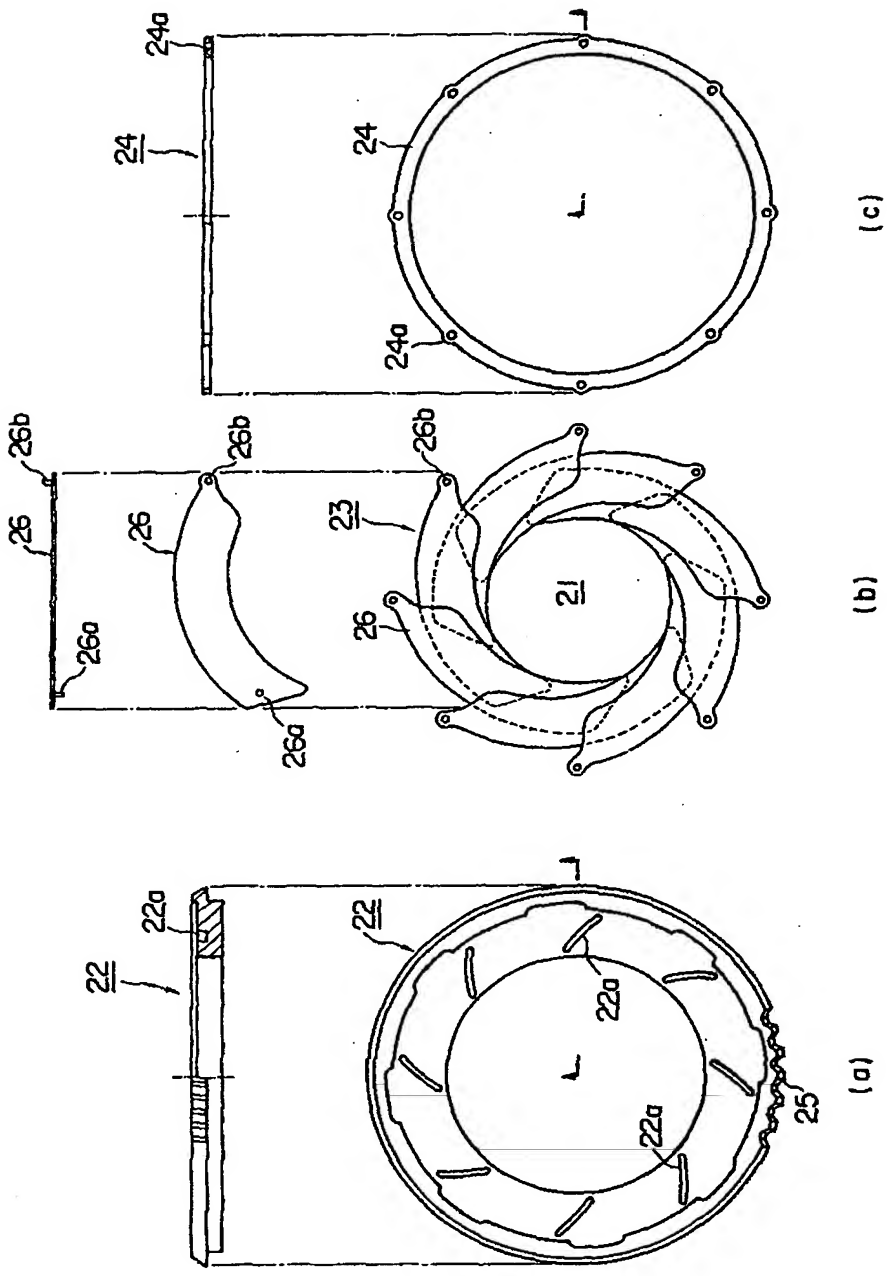
１……放射線源、２……試料、３……試料セット部材、５……放射線像拡大部、11……光電面（光電変換手段）、20……絞り手段、21……絞り窓、30……操作部材。

【第１図】



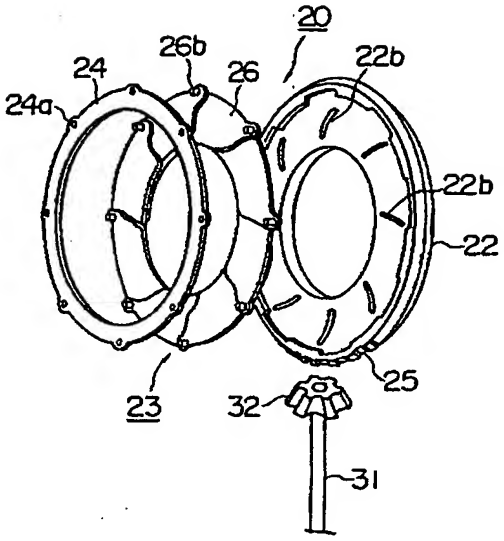
実施例の装置の全体構成

【第２図】


24a
24
24
24a
(c)
26b
26b
26b
26
26
23
21
26
26a
26a
(b)
22a
22
22
22a
22a
25
(a)

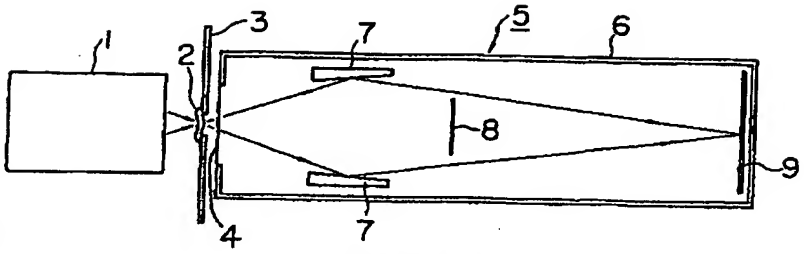
絞りの構成

【第３図】



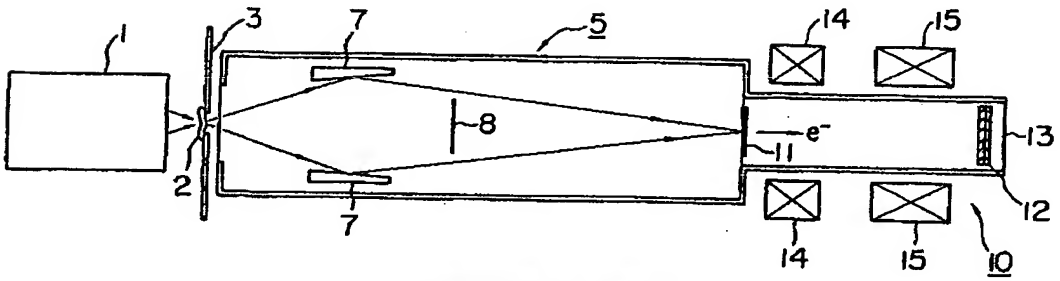
絞りの構成

【第４図】



従来装置

【第５図】



先願の装置の全体構成